Dental Plaque and Gum Disease

A build-up of plaque and tartar can lead to inflamed and infected gums. Mild gum disease is called gingivitis and is not usually serious. More severe gum disease (periodontitis), can lead to teeth falling out. Good oral hygiene includes regular tooth brushing and cleaning between teeth - for example, by flossing. This can usually prevent gum disease and treat mild-to-moderate gum disease. Specialist dental treatments may be needed for severe gum disease.

What are dental plaque and calculus?

- **Dental plaque** is a soft deposit that forms on the surface of teeth. It is made of many types of germs (bacteria) and the sticky materials that they excrete. The bacteria in plaque consume the sugars from our diet and excrete acid (which causes tooth decay) and other substances harmful to the soft tissues of the mouth. You can usually remove plaque quite easily by tooth brushing and cleaning between your teeth.

- **Calculus** is made of plaque which has absorbed calcium and phosphate minerals from saliva. These minerals are intended to strengthen tooth surfaces but when they crystallise in plaque they turn it into a hard substance, sometimes called tartar, which is very firmly attached to teeth. Early calculus deposits are as hard as chalk and are yellow in colour but they become darker and increasingly hard over time. Generally, calculus can only be removed by a dentist or dental hygienist, with special instruments.

What is gum disease?

Teeth are held in place by the gums (gingivae), bone and a specialised ligament (periodontal ligament) which attaches the teeth to the bone and acts as a shock absorber. These three tissues are collectively called the periodontium. Gum disease (periodontal disease) is a general term given to an infection or inflammation of the tissues that surround the teeth. There are two main types of gum disease - gingivitis and periodontitis.
Gingivitis

Gingiva or gingivae is the Latin term for the gums. Gingivitis means inflammation of the gums. It is a reversible condition which usually develops as a response to the presence of dental plaque on the teeth and gums - hence the name plaque-associated gingivitis. Removal of the plaque usually results in healing within a few days and there is rarely any permanent damage to the gingival tissue.

Periodontitis

'Peri-' is Latin for around; 'dont-' means tooth; '-itis' means inflammation. So, periodontitis literally means 'inflammation around the tooth'. In its early stages it shares all of the features of gingivitis, but as the condition progresses it can be distinguished from gingivitis by its destructive effect on the other periodontal tissues, ie the bone and periodontal ligament. The effects of this tissue damage are usually permanent.

At the start of periodontitis, the inflamed gingivae lose their attachment to teeth. This results in a gap, or pocket, between the tooth and gum (a periodontal pocket). The pocket provides a safe environment for more plaque to form and this leads a localised infection inside the pocket. This infection results in destruction of the bone and periodontal ligament in that area which in turn causes the pocket to become deeper. If left untreated this cycle will repeat itself until the tooth becomes looser and looser and eventually falls out or requires extraction.

Dentists assess the severity and progression of periodontitis by measuring the depth of the pockets that form between the gum and tooth. The aim of treatment for periodontitis is to remove the plaque and calculus from around the teeth and inside the periodontal pockets to prevent or limit further destruction of tooth-supporting tissues, ie the periodontium.

Plaque can be removed from shallow pockets (up to about 3 mm deep) by brushing and cleaning teeth in a normal way. However, deeper pockets need to be treated by a dentist or dental hygienist, as normal brushing and cleaning will not reach the bottom of the pocket.

The rest of this leaflet is about plaque and plaque-related gingivitis and periodontitis. There are other less common types and causes of gingivitis and periodontitis which are not dealt with further.

How common are plaque, gingivitis and periodontitis?

Plaque

Everybody has millions of germs (bacteria) in their mouths. Within a few minutes of tooth brushing, plaque will start to develop on the tooth surfaces. In less than 24 hours the layer of plaque that forms will usually be thick enough to see on the teeth. This is why dental advice is to brush twice a day, morning and night. This removes the plaque deposits before they have become very large and had a chance to damage the teeth and gums. Attendance for regular check-ups will allow your dentist to assess how effectively you are cleaning your teeth and provide oral hygiene advice and support if necessary.

Gingivitis

Everybody who allows plaque deposits to remain on their teeth and gums for more than two or three days will develop gingivitis. The severity of the condition will vary according to the size, age and distribution of the plaque deposits as well as the oral health and general health of the individual. Many people brush their teeth fairly well but do not clean between their teeth with floss or interdental brushes. The plaque deposits which build up between the teeth often cause a localised gingivitis which is often seen as swollen interdental papillae - these are the pointy bits of gum between your teeth. Most people who floss for the first time find that their gums bleed a lot. This is very common because they are disturbing the plaque and parts of the gum that have not been cleaned properly for a long time.

After a week of flossing twice a day the bleeding will usually stop. This is because the gums have had a chance to heal because they are not being irritated by plaque between the teeth anymore.
Periodontitis
Fortunately, unlike gingivitis, periodontitis will not affect everybody. Some people can have inflamed gums for years and experience little or no permanent damage to their periodontal tissues. However, the effects and consequences of periodontitis can be very severe in those who do have it. Approximately 50% of adults will have one or two areas of minor pocketing, and approximately 15% of adults are susceptible to developing moderate-to-severe periodontitis.

What causes gingivitis and periodontitis?

Gingivitis is caused by the germs (bacteria) in dental plaque and calculus. The bacteria release a variety of harmful toxins which can pass through and damage the gums. In an attempt to combat the effects of these substances the body diverts more blood to the affected areas of the gums, resulting in the classic red, swollen gums characteristic of gingivitis. Almost 50% of women will develop gingivitis at some time during pregnancy. This is due to the increased volume of blood and the effect of hormonal changes on soft tissues around the body during pregnancy.

Periodontitis is also caused by the bacteria in plaque and calculus but it is actually the body's own response to the bacteria and their toxins that causes the majority of the periodontal tissue damage. In its attempt to combat the bacteria, the body's immune system activates several powerful defence mechanisms and while destroying the bacteria, these defence mechanisms also inadvertently destroy periodontal tissues too. It's a bit like using a bomb to remove a cockroach infestation in your home. The insects might be destroyed but so is the property. Periodontitis does not affect everybody but it is more likely to develop in susceptible individuals with poor oral hygiene and/or those with immune system problems.

The following factors increase your risk of developing plaque-related gum diseases:

- Poor oral hygiene: a lack of effective regular tooth brushing and flossing will lead to the build-up of harmful plaque and calculus.
- Smoking: this alters your resistance to gum infection and affects the blood flow through the gums.
- A poor immune system: if you have an illness which makes your immune system less effective, such as systemic lupus erythematosus (SLE), or you are on chemotherapy, you are less able to combat the harmful effects of plaque and calculus.
- If you have diabetes.
- Increasing age: gingivitis can affect anybody with teeth, from babies to the very elderly. However, the most common form of periodontitis does not usually tend to manifest in susceptible people until after the age of 30 years.

What are the symptoms of gingivitis and periodontitis?

- **Mild gingivitis** - does not usually cause any symptoms, so you may not realise that you have it. The gums may look slightly swollen and reddened.
- **Moderate gingivitis** - can cause more marked swelling and reddening of the gums. The gums often bleed a little when you clean your teeth. Discomfort or pain from the gums is rare.
- **Severe gingivitis** - the gums may be very swollen and bleed profusely when teeth are being brushed and, in severe cases, even when food is being eaten. Tooth brushing may be tender but is rarely painful. One severe form of gingivitis is called acute ulcerative gingivitis (AUG). In this condition the gums are very swollen, fiery red and ulcerated with the interdental papillae between the teeth often being damaged. The gums are extremely painful to touch which makes eating very painful and tooth brushing almost impossible. More general symptoms include high temperature (fever), painful swollen lymph nodes and very bad breath. People who have AUG tend to be smokers with poor oral hygiene or people with immune system disorders, or those dealing with severe stress. AUG is treated with antibiotics and careful cleaning by the dental team as well as by the person with the condition.
- **Periodontitis** - does not usually cause any symptoms until an affected tooth becomes loose or an acute infection or abscess develops in the periodontal pocket adjacent to a tooth. However, in some cases, symptoms develop and may include:
  - Bad breath (halitosis).
  - A foul taste in your mouth.
  - Some pus formation in small pockets between the teeth and gums.
  - Pain and difficulty eating.
Affected teeth becoming loose and eventually falling out if not treated.

An examination by a dentist to detect the presence and depth of gum pockets is needed to confirm the diagnosis of periodontitis.

How can I prevent plaque-associated gum diseases?

Gingivitis
Good oral hygiene helps to keep plaque levels low and will prevent gingivitis and tooth decay. To reduce the likelihood of developing pregnancy gingivitis, women should try to maintain a very high level of oral hygiene, which may be more challenging during pregnancy, and visit the dentist if the gums bleed during tooth brushing.

Periodontitis
Very good oral hygiene will also limit the effects of periodontitis but it is important to understand that there is no cure for this condition. If you are one of the one in seven people who are susceptible to periodontitis, it is essential that you always maintain an excellent level of oral hygiene. As well as brushing your teeth very carefully you need to remove plaque deposits between the teeth and under the gums too. If there are low numbers of plaque germs (bacteria) present then your body will not initiate a big immune response and inadvertently damage the periodontium while it is attempting to defend itself. Regular visits to the dentist or dental hygienist will help to ensure that plaque and calculus deposits underneath the gums are removed. Your dentist may recommend minor surgery under local anaesthetic to adjust the shape of your gums to make them easier to clean at home. Your dentist may also refer you to a specialist in treating periodontitis-related conditions (a periodontologist) if they think your condition requires it. Quitting smoking is also a very important factor in limiting the harmful effects of periodontitis in susceptible individuals. Of course there are many other health benefits to be achieved from quitting smoking, such as lowering the risk of various cancers such as oral and lung cancer, and lowering the risk of many cardiovascular diseases too.

Good oral hygiene means brushing your teeth - for two minutes, at least twice a day. Ideally, brush your teeth either just before eating, or at least an hour after eating.

See separate leaflet called Oral Hygiene for further details.

What is the treatment of plaque-associated gum disease?

If you have gingivitis
If your gums bleed when you brush your teeth try to see where the bleeding is coming from. If it is just from one or two sites on the gums then careful tooth brushing and flossing in those areas will usually resolve the problem within a day or two. If the gingivitis is more severe and your gums bleed a lot you should visit your dentist. He or she will provide appropriate oral hygiene advice and probably carry out a 'scale and polish'. This is a tooth-cleaning procedure using an ultrasonic scaler and polishing instrument to remove plaque and calculus deposits from around your teeth and gums. This procedure may be a bit tender, especially if your gums are very inflamed; however, it is necessary to remove the germs (bacteria) that have caused the problem, and the teeth usually feel lovely and clean afterwards. In addition, your dentist may advise an antiseptic mouthwash (and/or antiseptic toothpaste, gel, or spray). These help to kill bacteria in the mouth and help to resolve any gum infection.

Chlorhexidine is a commonly used antiseptic mouthwash. If you are advised to use it you should rinse your mouth well with water between brushing your teeth and using chlorhexidine. This is because some ingredients in toothpaste can inactivate chlorhexidine. Chlorhexidine may also stain teeth brown when used daily for more than 7-10 days. This staining can be easily polished away by a dentist or hygienist. Staining can be reduced by:

- Brushing teeth before (but not after) using the chlorhexidine.
- Avoiding drinks that contain tannin, within 2-3 hours of using chlorhexidine (for example, tea, coffee and red wine).
- Using the 0.2% solution instead of higher-strength solutions.
If you have periodontitis

This condition will be diagnosed by your dentist during your routine dental inspections or if you attend for an emergency appointment. In addition to the measures described above to treat gingivitis, you are likely to need specific dental treatment to assess the extent of your periodontitis and implement measures to try to limit the progression of the condition. People with periodontitis do not lose their periodontal tissues (gum, bone and periodontal ligament) at a continuous rate from the age of 30 onwards. Instead the condition goes through phases of inactivity which may last months or years followed by short intense periods of disease progression when the body reacts to plaque and calculus deposits around the teeth or in the periodontal pockets. It is during these active periods that the destruction of the periodontal tissues takes place. The aim of treating periodontitis is to help the individual to achieve the highest possible standard of oral hygiene and to remove bacteria from deep pockets at appropriate intervals so that the body undergoes as few periods of destructive periodontitis as possible. It's impossible to predict when the body might suddenly react to the bacteria so it is necessary to keep the bacteria levels as low as possible continuously.

Standard treatment for periodontitis involves measuring the depth of any periodontal pockets, using a dental probe, around all of the teeth to identify which ones are deeper than 3 mm. All of these deep pockets are carefully cleaned by the dentist or hygienist to remove plaque and calculus deposits. Effective cleaning of multiple deep pockets can be a very sore process so you will usually be offered local anaesthetic to make the treatment more comfortable. To avoid having your whole mouth anaesthetised at the same time it is customary to have the treatment carried out over several appointments. After cleaning, ideally the gum will reattach itself to the tooth surface and reduce the depth of the pocket. However, because of the effects of the disease process on the periodontal tissues and the roots of the teeth it is not usually possible for the pockets to heal completely. If appropriate oral hygiene measures are not maintained then plaque and calculus will quickly build up again in the pockets and lead to further tissue damage over time. This is why it is important for people with periodontitis to follow dental advice regarding appointment schedules. Treatment regimens may require a course of several measuring and cleaning appointments every three or four or six months depending on the severity and stability of each case.

Bleeding

Treatment for plaque-related periodontal conditions often results in quite a lot of gum bleeding. This is quite normal because the gums are usually very inflamed. However, there is a risk of causing dangerous amounts of bleeding if you have certain medical conditions or are taking certain types of medication. To help the dental team treat you safely it is very important that you tell them if you have any increased risk or history of excessive bleeding. This includes liver diseases, blood conditions (such as haemophilia) and medications including aspirin and anticoagulants like warfarin, rivaroxaban (Xarelto®) and dabigatran (Pradaxa®).

Oral hygiene, gum disease and heart disease

In addition to the benefits to your teeth, good mouth hygiene may have even further benefits. There is some evidence to suggest that poor oral hygiene is associated with an increased risk of developing heart diseases such as:

- Heart attack and angina.
- Other blood vessel-related problems (cardiovascular disease).

One research trial followed over 11,000 Scottish people - see references below. The trial found that those who reported poor oral hygiene (never or rarely brushed their teeth) had an increased risk of developing a cardiovascular disease. It is not clear if this is a direct cause and effect or simply an association or chance finding. That is, it is not proved that poor oral hygiene can actually increase your risk of cardiovascular disease. However, there is a plausible theory that mild inflammation and infection in the mouth can get into the bloodstream to trigger mild inflammation in the blood vessels, which, over time, can lead to cardiovascular diseases. Further research is needed to clarify this possible link. But, in the meantime, it may be an additional reason to look after your teeth and gums.
Further reading & references

- Dental interventions to prevent dental caries in children; Scottish Intercollegiate Guidelines Network - SIGN (Mar 2014)

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